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# Guidelines for the Formulation of Research Project Proposals



Edited by

S O Keya • B F Makau • J Mani • I M Omari



NATIONAL COUNCIL  
FOR SCIENCE AND  
TECHNOLOGY  
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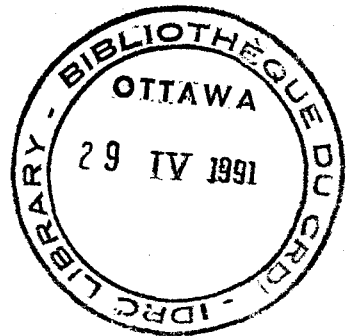
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GUIDELINES FOR THE FORMULATION  
OF RESEARCH PROJECT PROPOSALS

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S.O. Keya, B.F. Makau, J. Mani and I.M. Omari



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# *Formulation of research project proposals*

## PREFACE

Research is recognized as being an important input in the national development of any country. Yet, in the 1980s the levels of investment by less developed countries (LDCs) in research and development (R & D) was below the recommended 1 per cent of their gross domestic product (GDP) and is currently estimated at 0.04 per cent. In the LDCs, the greater share of research expenditure is naturally channelled to the agricultural sector. The allocation to other disciplines tends to be very low. This picture compares poorly with allocations to R & D in more developed countries (MDCs) which invest between 4 and 12 per cent of their GDP.

Apart from low levels of investment in research, there are other constraints that disadvantage a prospective researcher in the LDCs. These constraints include lack of adequate manpower; poor infrastructure; low institutional capacity in libraries, laboratories and equipment; lack of incentives; inadequate funding and mismanagement of resources.

Besides these environmental and institutional constraints, it is acknowledged that research is expensive and usually long term, but that the payoffs are worthwhile for long-term development. Therefore, there is a need for greater commitment from all those concerned, both in terms of policy, planning and actual allocation of resources for research.

Currently, there are various kinds of institutions that are able to fund research projects. These organizations range from international, regional, local and non-governmental institutions to private foundations. Each of them has its own requirements with respect to format, substance and quality of research project proposals. However, some requirements are basic and applicable to a variety of institutions and disciplines.

In June 1986, the Kenya National Council for Science and Technology (NCST) organized a workshop on research project proposal formulation. The workshop was held at Kericho, Kenya and was attended by research managers from Kenyan research institutions. It was sponsored by the International Development Research Centre (IDRC). The main objectives of the workshop were:

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- (a) To sharpen the skills of senior researchers in the writing of research proposals;
- (b) To set up a network of research trainers in order to enhance collaboration and productivity in research activities in Kenya;
- (c) To formulate guidelines for a training manual on the preparation of research project proposals.

At the end of the workshop, it was clear that the potential for securing more resources for research from funding agencies exists but that the quality of presentations and proposals needed to be improved. In addition, it was evident that there were more technicalities involved in preparing research proposals designed for the procurement of new resources than are covered in the standard research methodology textbooks and courses. Researchers needed to be familiar with the general format and requirements for preparing research proposals for funding by different agencies and councils. As a result, the NCST, with financial assistance from IDRC, undertook the task of preparing a manual on research project proposal formulation and writing.

However, in taking up this challenge, the NCST felt that such a publication, while containing adequate information to guide the potential researcher effectively, should avoid the amount of detail that would make it too bulky and complicated to be a practical reference book. In addition, it was deemed essential that the publication should have wide appeal to a scientific community beyond the national boundaries of Kenya. It was, therefore, decided that the publication be called *Guidelines for Formulation of Research Project Proposals*. These guidelines contain information and hints which can be applied to most research areas, levels, and types of research. The responsibility of the researcher to the funding agencies, his own institution of affiliation and colleagues, and procedural matters are also emphasized. A selected bibliography is also presented to enable the researcher to obtain additional information specific to his discipline and area of interest. It has to be appreciated that proposals may differ depending on the specific requirements dictated by disciplines such as agriculture, medicine, industry, and the natural, physical and social sciences and that each funding agency may have specific requirements.

The objectives of these *Guidelines* are to:

- (a) Create awareness about sources of funds for research in different areas of national development (both local and international sources);
- (b) Stimulate the initiative to apply and compete for these research grants, both by individuals and institutions;

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- (c) Present, in as concise terms as possible, the essential features of technically acceptable research proposals;
- (d) Sensitize applicants to the responsibilities arising out of a successful application for a research grant, such as ethical issues, adequate reporting, and overall management of the project, including the funds; and,
- (e) Eventually ease the work of funding agencies in processing applications for research grants by reducing the time required for considering the applications.

It is hoped that these *Guidelines* will meet most of the needs of researchers intending to develop research projects. They should be handy for young researchers as well as middle-level professionals who have not interacted with funding agencies to any great extent. Senior researchers and managers could also find these guidelines useful for training personnel under their tutelage or leadership in research centres and institutions of higher learning.

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## *Formulation of research project proposals*

## Chapter 1

### THE ELEMENTS OF A RESEARCH PROPOSAL

#### CONCEPTUALIZATION OF THE RESEARCH PROJECT

##### Introduction

It behoves every researcher to convince others that the idea behind his research and the plans he intends to formulate in a proposal are worth supporting. Sometimes those who screen proposals for funding, as well as for implementation, are accused of not being fair in evaluating the proposal. However, it should be remembered that these persons also have a responsibility to act in accordance with the mandate and philosophies of the organizations they represent. In fact, usually, the two parties do not occupy antagonistic positions but rather they are partners in development. All have to take their responsibilities seriously and be accountable for their actions. Therefore, researchers should make the proposals convincing, well thought out, clear as to intent and outcome, and thorough in content and method. Such traits facilitate the screening process, enabling the proposal to withstand intense competition for limited resources.

##### The Research Process

Research has been described by various authors as being a purposeful, controlled, formal, systematic, critical, and intensive activity. It is a process which has a continuum of interrelated or interlocked sub-activities and sub-processes, starting with a needs assessment and ending with the way in which the results will be utilized for development (Figure 1).

The researcher, while developing a proposal, has to see the research process in its totality. One has to have a comprehensive picture of all the activities and processes that make up a research proposal. This starts at the conceptualization stage even before one begins to write the actual proposal, and the process is enriched by reading related literature. It is the clarity, motivation, imagination, and vision in an idea which make one the master

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mind of it. As one sets out to write a first draft of a proposal, one should imagine the critical readers who will eventually see it. Indeed, the first attempt should be taken as a draft for peer review and one ought to be prepared to accept criticisms, including eventualities such as revisions and rejection.

1	2	3	4	5	6
Needs Assessment	Methods of Study	Data Analysis	Interpretation	Dissemination	
<ul style="list-style-type: none"> <li>- Problem identification</li> <li>- Problem articulation</li> <li>- Problem justification</li> <li>- Problem legitimacy</li> <li>- Objectives - general</li> <li>- Objectives - specific</li> <li>- Purpose/aims</li> <li>- Assumptions</li> <li>- Limitations</li> <li>- Hypotheses/themes/arguments</li> <li>- Concepts to be operationalized</li> <li>- Reviews of theoretical works</li> <li>- Review of previous studies</li> <li>- Synthesis of problem area</li> </ul>	<ul style="list-style-type: none"> <li>- Population</li> <li>- Samples                             <ul style="list-style-type: none"> <li>- random</li> <li>- cluster</li> <li>- stratified</li> </ul> </li> <li>- Internal and external validities</li> <li>- Costs vs. validities</li> <li>- Types of design                             <ul style="list-style-type: none"> <li>- historical</li> <li>- descriptive</li> <li>- developmental</li> <li>- case study</li> <li>- correlations</li> <li>- causal comparative</li> <li>- experimentation</li> <li>- quasi experiments</li> <li>- action research</li> </ul> </li> </ul> <p>Instrumentation</p> <ul style="list-style-type: none"> <li>- Procedures for their development/acquisition</li> </ul> <p>Types</p> <ul style="list-style-type: none"> <li>- Questionnaires</li> <li>- Checklists</li> <li>- Observation &amp; interview schedules</li> <li>- Tests IQ/achievement</li> </ul> <p>Laboratory analyses</p> <ul style="list-style-type: none"> <li>- Procedures for field-work</li> </ul>	<ul style="list-style-type: none"> <li>- Types of data generated                             <ul style="list-style-type: none"> <li>- continuous</li> <li>- frequencies</li> </ul> </li> <li>- Types of analyses</li> <li>- Types of tables</li> <li>- Facilities for data analysis                             <ul style="list-style-type: none"> <li>- personal</li> <li>- computers/calculators</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>- Why those findings</li> <li>- What can be said and what cannot about the problem</li> <li>- Who is to interpret the data?                             <ul style="list-style-type: none"> <li>- team</li> <li>- respondents</li> <li>- beneficiaries</li> </ul> </li> <li>- Equivocal and unequivocal conclusions</li> <li>- Uninterpretable data</li> <li>- Further analyses required</li> </ul>	<ul style="list-style-type: none"> <li>- Audience and why</li> <li>- Types of reports                             <ul style="list-style-type: none"> <li>- Journals</li> <li>- Conference</li> </ul> </li> <li>- Agency                             <ul style="list-style-type: none"> <li>- Government</li> </ul> </li> <li>- Executive briefs</li> <li>- Seminars</li> <li>- Workshops</li> <li>- Follow up activities</li> <li>- What should have been done differently?</li> </ul>	
					Utilization of Results
					<ul style="list-style-type: none"> <li>- Choice of users</li> <li>- Choice of technology and designs</li> <li>- Convenience issues</li> <li>- Side effects</li> <li>- Cost issues</li> </ul>

Figure 1. The research continuum

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### **Some Areas of Concern in Proposal Development**

#### *Whose Research Priorities?*

Very often, donor agencies have their own research priorities, agenda, and directions, some of which have relatively little legitimacy in the researcher's home country. This has caused distortions in the research programmes of many institutions as programmes oscillate from one sponsor to another and from time to time. It is important, therefore, that researchers and their institutions should have viable research programmes from which projects are developed. Likewise, funding agencies should respect these programmes and be flexible enough to accommodate a diversity of research interests. Many institutions compile lists of unrelated research topics which may not form any coherent theme or programme. The topics also tend to be static and sometimes are hurriedly assembled to meet donor requests. Of course, the instability of the environment and situations in developing countries require some flexibility so that new developments such as drought, outbreak of diseases or coup d'états, can be taken into account. Nevertheless, it is desirable to plan a research programme into which both long- and short-term projects may fit and they should be reviewed regularly so as to achieve temporal relevance.

#### *Length and Marketability*

There is no standard for the length of a research proposal. However, since few readers have a lot of time, the shorter the proposal the better. It is the conciseness, clarity and brevity of the proposal which is important. The language should be simple and lucid but technical, appealing, and readable so as to inspire confidence and interest. It should highlight the innovative features in the study and should show how it meets the challenges of development in the given country or area of study.

### **ESSENTIAL COMPONENTS OF PROPOSALS**

Figure 1 shows the six main groups of activities involved in research proposal formulation as:

1. An assessment of the need for the research project;
2. Methods of the study;
3. Data analysis techniques;
4. Interpretation of results; and
5. Dissemination and
6. Utilization of results.

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Ordinarily, these six stages in proposal formulation can be further elaborated into 13 elements or components which any reader of a proposal looks for. They include content and methodological and procedural elements in the following order:

1. Title -- short, clear, concise;
2. Abstract or summary of the proposal;
3. Background to the problem;
4. Aims, objectives, and hypotheses of the study;
5. Literature review;
6. Methodology of investigation;
7. Description of the institution housing the project;
8. Work plan, schedules, and/or phases;
9. Budget;
10. Ethical considerations;
11. Outcomes/results, the users and uses;
12. Bibliography/references; and
13. Appendices/annexes.

These elements will be elaborated on below, but two components need separate treatment at the outset. These are the Abstract and the Appendices.

### **The Abstract**

An abstract provides a precis of the whole problem to be investigated. It is a useful resumé, particularly when a proposal is long, complex, elaborate and involves large sums of money. It should be concise but informative. It is essential to develop these content-reduction skills since very often researchers are expected to be able to say what is contained in a lengthy proposal or paper in just one page. The abstract serves the following purposes.

First, it portrays the proposed on-going task or a completed research project. In scientific research publications, such an abstract becomes available to many readers who want to know what is going on elsewhere. Secondly, it provides senior executives and donors with a summary of what kind of research activities are envisaged, and what is to be accomplished. Often executive personnel do not have the time to read the whole paper or proposal. Finally, it informs and entices colleagues to read your work.

The abstract of a proposal should contain the following points in approximately 300 words, or no more than one page.

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- Project title;
- Statement of the problem, objectives, and hypotheses;
- Methods to be deployed in investigating the problem;
- Expected results and institutions/people involved;
- Statement of the budget and when the work is expected to be carried out.

An abstract may provide some data but not references. An abstract is always paraphrased and telegraphic.

### **Appendices**

A proposal is expected to be complete in conveying all the necessary materials, as stated above. However, occasionally additional details are difficult to accommodate within the standard headings without making the entire proposal too bulky. In such situations, these details are put in as appendices which can either be bound together with the proposal or attached separately. It should be remembered though that appendices are not substitutes for clear presentation of the actual proposal. The reader should only be directed to the appendices for details. In many situations appendices are not necessary.

Some inclusions which commonly appear as appendices are:

- Detailed questionnaires; experimental designs; tests, interview schedules; maps; and statistical procedures to be used;
- Lists of bibliographic entries which the author has not read thoroughly but is aware of and intends to cover later;
- Detailed budget breakdown and notes;
- Samples of research materials (biological specimens, chemicals, original scripts);
- Dummy tables;
- Results of any pilot studies.

## Chapter 2

### RESEARCH PROBLEMS AND OBJECTIVES

#### PROJECT TITLE

A project title should be descriptive, clear and short. It should capture and reflect the content of the research proposal. The title should enable readers to understand the concepts, methodologies and output of the study.

#### BACKGROUND TO THE PROBLEM

In any research proposal, an introductory paragraph about the problem is essential. This is a concise, descriptive, informative, and climate-building preamble culminating in a statement of the problem being addressed. A logical and balanced statement helps to portray a researcher's vision of topical issues to be investigated. The researcher is expected to justify why resources should be committed to the proposed work. In doing so, the writer must indicate the gains likely to accrue from the findings in relation to what has been done. In some cases, bridging gaps in basic knowledge might be acceptable, but researchers should not get carried away by their scientific or theoretical concepts forgetting that ultimately research is for the benefit of people.

An author of a project proposal is expected to review previous work to reveal what is known of the subject, gaps in knowledge, current trends and what are perceived as flaws in current practice.

Some questions to be addressed here may include:

- What current and previous studies have been done on the issues to be studied?
- What is the available information on the magnitude, nature, and causes of the problem?
- What are the present gaps in knowledge?
- What makes the problem worth studying?
- Why has the problem not been tackled yet?
- What do you intend to do to fill the gaps or solve the problem?

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- What is the conceptual framework on which your study will be based and what are the tentative hypotheses to be employed in answering the questions?
- Will the study engage your attention and intellect or do you intend to do it for the sake of getting funds or for academic purposes only?
- Does the solution to the problem have any practical or theoretical significance?
- What are the social, economic, political, technical and environmental considerations involved?
- Have you stated the assumptions relevant to the study?

When the above questions have been addressed, then state why the proposed investigation is conceived in the light of the information available.

### **AIMS AND OBJECTIVES**

What is to be achieved by the proposed investigation has to be stated plainly and concisely. Every study must have overall aims and specific objectives.

In some studies, objectives are measurable and in others not, but one should always have aims and objectives to guide the investigation. Both aims and objectives should be:

- Cohesive and logically arranged;
- Specified in long- and short-term parameters;
- Relevant to the problem statement;
- Stated in a form which shows the relations between the variables;
- Not too many.

### **Examples of Good Titles, Aims and Objectives of Research Proposals**

Whether the title, aims and objectives of any given study are relevant can only be arrived at after reading and understanding the context and background of an entire proposal. The examples provided here are limited. It is recommended that you always consult post-graduate theses or successful project proposals and refer to papers in journals to get an idea of a wider range.



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### *Examples*

1. Title: Rating soil conservation practices in environments susceptible to erosion:

General aim: Examine the conservation practices in places likely to suffer from soil erosion.

Specific objectives:

- Test the effectiveness of existing conservation and management systems in specific environments characterized by high erosion hazards.
- Prepare handbooks on recommended conservation practices for defined farming systems and environments.

2. Title: The distribution of educational resources and opportunities in Kenya by location, sex and level.

General aim: Determine factors influencing the distribution of educational resources.

Objectives:

- Examine the factors determining the levels and nature of educational resources and opportunities.
- Analyse the socio-economic differentiation within regions and social groups in relation to organization and financing of the educational system.

3. Title: Rural industries and acquisition of technical skills.

General aim: Examine the impact of rural industries on acquisition of skills.

Specific objectives:

Provide information that may partially answer the following questions:

- Do rural industries serve as a training ground for self-employed rural entrepreneurs and for workers who become dispersed in other sectors?
- What is the position of workers coming from rural industries in the urban setting?
- Is there a pool of skilled labour which is not being fully utilized for developing rural industries?

4. Title: The vector control of onchocerciasis (African river blindness) in West Africa.

General aim: Analyse methods used to control vector-borne diseases.

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### Specific objectives

- Design a biological control method for the blackfly vector of onchocerciasis.
- Develop an organization for co-ordinating the control of African river blindness.

### HYPOTHESES AND RESEARCH QUESTIONS

The formulation of hypotheses and research questions varies with academic disciplines and the nature of the study. However, all proposals need to have explicit or implicit themes, arguments and postulates to guide each step in the investigation process. Given that research is expensive, it is vital that concepts to be tested are properly conceived from the very beginning. In Kenya, for example, most agricultural research proposals are formulated from ideas originating from the following sources: the researchers, farmers, extension workers, research organizations or government agencies. Once a problem has been identified, it becomes the task of a researcher to formulate plausible solutions to the problem. Whatever the problem is, it is ultimately the researcher who has to formulate the hypotheses required for solving it. Using experience, intuition and consultations, the scientist scans a variety of questions to come up with guiding hypotheses and techniques for verifying them. For example:

- Is the hypothesis testable?
- Why is the hypothesis valid?
- To whom is the problem relevant?
- Will the results solve the problem?
- How much will it cost in terms of time and money to do the study?
- What are the potential outputs and impacts (intended and unintended)?
- What are the constraints to carrying out the study?
- Are there alternative solutions to the problem?

Before any practical work starts, a thorough theoretical assessment must be made in order to reduce the number of preliminary investigations and ensure that information already available is fully utilized. While refining the conceptual framework, there may be a need to pretest the methodology and adjust it accordingly.

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### **Examples of Hypotheses**

Very often researchers experience problems in stating the hypotheses and the problem at hand. Yet it is extremely important to state the problem and the hypotheses, themes or arguments in the most clear terms for readers to follow the thrust of the argument. Examples of hypotheses based on the above aims and objectives would read as follows:

- "There is a positive and significant relationship between soil conservation practices and level of erosion susceptibility in the environment."

Or one could have the inverse hypothesis and say that there is no relationship at all between these two variables. This is what is called "null hypothesis".

- "The distribution of educational resources is directly related to class and ethnic groups in the country."
- "Rural industries do not impart skills relevant to the urban environment."
- "Vector control methods for onchocerciasis only work to the extent that there is popular participation in their design."

It will be noted that each hypothesis implicitly states the research problem since it gives the lines of investigation and the variables to be studied.

### **LIMITATIONS**

Since every research project proposal is unique, it will have various practical and theoretical drawbacks which must be stated and taken into account. An early realization of these parameters can assist the investigator to avoid pitfalls, over-expectations, underestimates, and frustrations.

Below are some examples:

Finance: How much money is available and in what form?

Audience: Who will be the final consumer of the results?

Weather: How will the prevailing weather conditions affect the implementation process?

Transportation: Have adequate arrangements been made for it?

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**Study population:** Check on ethical issues. Can one obtain adequate samples? Is the study area and the sample representative?

**Scope and size:** Is the topic or area too big or too small?

**Logistics:** Have you taken into account every anticipated logistical problems? Have you considered the necessity of synchronizing signing of agreements with receipt of money and training and deployment of human resources.

**Treatment capabilities:** Have you consulted a statistician to ensure that the study design has provided for crucial analyses? Can the results be analysed and generalized? Is it possible to modify the design later without sacrificing accuracy?

**Tools and instruments:** Have you provided for the right equipment, tools, field and laboratory equipment and related items?

**Time span:** Can you solve the problem within the time requested? Does the workplan tie up with your other commitments? Is there provision for making mid-course corrections?

**Legalities:** Are there any legal, institutional, management or related requirements? For example, do you require clearance before you embark on the research?

## LITERATURE REVIEW

### Meaning

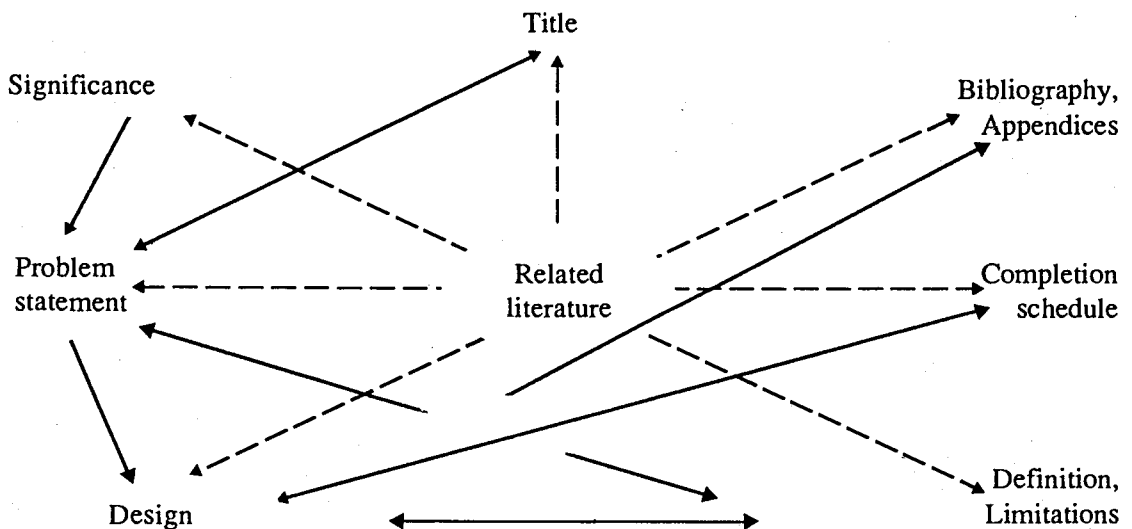
The best advice about literature review is contained in the contention: "Research starts in the library and ends in the library". According to Webster's Dictionary (1980)<sup>1</sup>, review means "See again, examine or study again, to re-examine judiciously, to look back, take a retrospective view of, examine critically or deliberately, to give a critical evaluation of". In the context of literature review, it means locating literature in a variety of sources, reading it carefully and thoroughly, evaluating the content, breaking it down into themes and organizing it along the themes of the study. This can only happen if you are clear on the headings and sub-headings of the whole study, which then become the lines upon which the literature review will be organized.

1. Webster's New Collegiate Dictionary. Springfield, Mass., G. and C. Merriam Company, 1980, p. 984.

## *Formulation of Research Project Proposals*

### **The Purpose and Importance of Literature Review**

Literature review is a continuous process that cuts across all stages of the research process in a dynamic way (Figure 2). The review helps to clarify, strengthen, and direct each stage of research from the formulation of a research topic to the mechanisms for the dissemination and utilization of the research findings. In general, however, a review of the relevant literature serves six main purposes, as described below.



Source: Castetter, W. B. and Heisler, R. S. 1982. *Developing and Defending a Dissertation Proposal* (3rd ed.). University of Pennsylvania, Philadelphia..

**Figure 2. Illustrative Linkages Among Proposal Components**

#### *1. Benefit from Previous Findings*

It is a truism to say that all knowledge is an accumulation of the unique contributions of previous research. It would be unwise if a researcher did not take advantage of the works of others who have investigated similar problems. In this way a more comprehensive view is obtained of the dimensions of the problem, the potential difficulties in that area of investigation, and the unique context and potential contribution of the current research project. Indeed, other researchers might have done exactly the same study in recent times. The review may lead to either changing the study topic or reshaping it to cover gaps that others did not cover or overlooked. The review may also help to avoid sterile problem areas where research has failed to provide any meaningful results.

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### *2. Improve Methodological and Procedural Matters*

Very often researchers put together research proposals without paying enough attention to methodological and procedural issues. They want to start the research design as soon as they have secured funding. However, this is the wrong way round since research designs differ in their implications. Thus, prior familiarity with a variety of procedures and research designs enables one to judge their applicability to the problem and the cost of using each of them. For instance, one has to know what case study is in order to be able to apply and cost it appropriately. There are books and review articles on the various research procedures and designs. There is no point in "reinventing the wheel", so one can use designs which have already been used by others.

### *3. Development of a Theoretical Framework*

Very often researchers are challenged to articulate the theoretical or conceptual framework of their study. Most phenomena which lend themselves to research have a contextual body of knowledge, and the ultimate purpose of research is to develop general but unified explanations that extend this pool of knowledge. Thus, before one plunges into the mechanics of research, it is important to search for the theoretical background of the problem. In fact, it is this familiarity which enables the researcher to make succinct statements of the problem and develop plausible explanations which can take the form of hypotheses, or themes, or arguments. The emphasis is on bringing order, unity and simplicity to what is being investigated.

### *4. Evaluate Previous Studies*

One other function of the literature review is to assess and evaluate the importance and significance of existing studies. Not everything that is published is worthy of attention. Each study has to be assessed on its own merits to determine its soundness, relevance and design, the accuracy of the data and the validity of the interpretations. In this process, one has to work hard to avoid falling victim to biased perspectives and being tempted to take as confirmed findings which are only preliminary hints. One must remain critical and open minded, as the outcome of the research could either confirm or disprove the given hypotheses.

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### *5. Avoid Duplication*

While it is not possible to review all published and unpublished studies around the world, one does not want to duplicate a study unintentionally. Reviews of literature help to minimize the chances of duplicating studies identical to the one under consideration. However, it should be noted that there is nothing inherently wrong with replicating a previous study if there is a good reason for doing so. For instance, one can aim to challenge and/or verify some doubtful findings.

### *6. Argue a Case for the Present Study*

The selection of the research problem has to be justified and supported by the review of related studies. It is in this comprehensive and critical review of selected studies that the problem becomes apparent. As the researcher argues his case he shows how the study will enlarge, modify, depart from or complement existing knowledge.

## *Sources of Literature*

Ordinarily, two sources of literature can be identified, namely primary and secondary.

### *Primary sources*

These are the original documents, reports of an account of events such as agreements or treaties between two or more parties, development plans, court-case judgements, letters from one person to another, or district annual reports. Some books and research articles in professional journals are primary sources, but the majority of them are both primary (e.g. the actual data and what the researcher says about them) and secondary sources (e.g. authors' reviews of other works).

### *Secondary sources*

These are generally reviews, summaries and citations of other works and journal articles where authors discuss other peoples' views and ideas in relation to their own. One major advantage of using secondary sources is the time saved and the availability of footnotes, references and bibliographies which are available alongside secondary sources. However, there is also a disadvantage to it as the investigator may

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fall victim to other peoples' judgements, evaluations, perspectives and biases which arise from either incapacity or conscious and unconscious omissions. There are many instances of accumulated inaccurate citations due to reliance on secondary sources. It is always advisable to rely on primary sources, or at least to check all citations with the original sources.

### **Use of Related Sources**

Research projects are often less narrow than researchers take them to be. Developmental problems have parameters beyond narrow, discipline-oriented solutions. That is why recent thinking points toward the use of an interdisciplinary approach to their solutions. Thus, researchers are always advised to have open minds and the patience to read sources which are not directly related to their own study but which could be useful. For example, a researcher in an economics issue such as falling productivity of rural-produced commodities may find useful insights in sociology, psychology, agriculture and geography in addition to economics. Yet a researcher must know when to stop a given review, thereby avoiding wasting time on themes and items which will give very little return.

### **Types of Literature**

It is important for the researcher to distinguish the various types of literature that should be consulted as each contributes in its own way to the different sections of the proposal. The following are common categories of literature.

#### *Theoretical Works and Reviews*

Books such as the Bible, Karl Marx's *Das Kapital*, works on African Socialism, or Newton's relativism are theoretical works which attempt to explain certain phenomena. One needs to consult them. In each field there have been many theoretical formulations geared towards explaining relationships between phenomena and other realities. Some disillusioned researchers make disparaging remarks about theories, but that is where all researchers should begin. It is said that research without theory is blind, and theory without practical focus is empty.



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### *Methodological Reviews*

Many findings are disproved due to methodological flaws and others are confirmed over and over again. There are books on research methods and you need to select a research design on the basis of knowledge of the array of designs rather than differential familiarity and guesswork. It is competence in research methods which produces useful data.

### *Original Findings and Reviews of Them*

Most books and extended review articles on research topics have been reviewed and criticized by various authorities. You need to read both the original works and the reviews on these works in order to understand and contextualize the research problems.

### *How to Obtain Relevant Literature*

One legitimate complaint from researchers in developing countries is the lack of relevant and up-to-date literature on topics in their fields. Yet more research has to be done to increase the volume of literature available to these researchers. Sometimes the complaint can be justified, but sometimes it cannot. Sometimes we do not try hard enough. The beginning of literature review is first to systematically break down the title of the study into key words, phrases, causes, main headings and sub-headings. This is an essential and important step, for otherwise a great deal of time will be wasted.

The next step is to approach specific sources, which include the following non-mutually-exclusive categories:

#### *Books*

Both theoretical and research-based textbooks form a good entry point, using both the detailed table of contents, references, bibliographies and author indices as leads to relevant portions of the book.

#### *Abstracts*

Most fields have regular author and subject abstracts which are very useful for locating relevant sources for review.

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### *Journals*

Both discipline-oriented, interdisciplinary and collateral journals contain relevant articles and reviews. They are the most up-to-date sources of information in each discipline.

### *Encyclopaedia and Handbooks*

These are very useful for general understanding of the field and clarification of key concepts.

### *Personal Communications*

Hints and leads in private and public files may help to clarify and delimit the problem area.

### *Grey Literature*

This is found in offices, research stations and files. It is the most neglected source of ideas and yet extremely useful in giving a study legitimacy and providing an up-to-date picture of the situation.

### *Newspapers and Magazines*

While these are fraught with journalistic biases and limitations, they provide hints on areas of concern, the magnitude of the problem, and its sensitivities. Most newspapers and magazines carry scientific articles which can also be useful.

### *Oral Literature*

Many authorities and informed persons do not get a chance to put their thoughts down in a systematic manner. In developing countries, it is said that when an important wise old person (such as a chief) dies, it is like a library burning down for the literature in his head is not in a retrievable form. Researchers need time to consult oral sources which help to clarify a research problem. These include both illiterate and highly literate authorities on particular issues.

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### *Specialized Agencies*

Most specialized agencies keep special libraries for their reports and highly specialized literature. Most of these agencies are prepared to order materials for researchers in developing countries. Establishing contacts with appropriate persons in them is often important.

### *Visits*

Visits should be made to appropriate research stations or field situations to consult or to make relevant observations. Proposals are not just conceived in laboratories, offices and libraries. Direct encounters with problem-related situations and persons make proposals more thorough and legitimate.

### *Modern Technologies*

Electronic data handling and informatics have made it possible to drastically condense bulky literature. Modern microfiches carry both published and unpublished works and, where relevant, one should consult such facilities to determine the latest information in the relevant fields. They are particularly important in the area of grey literature.

### *Authenticity and Accuracy of Literature*

A piece of literature can only be useful if it is authentic and accurate. Authenticity refers to whether the document is an honest outcome of purposeful activity. Some documents are forged, some are designed or conjured for deceit out of ulterior motive and malice. One should be on the look out for these.

Authenticity also has to do with whether the document can be identified with a particular source or author. Anonymous articles are useless as cited evidence. This becomes worse when one cannot establish the date of the document. Very often, one cannot cross-check the source and one cannot replicate the event. Useful sources must be amenable to cross-checking.

However, authenticity is not proof of the accuracy or value of a document. Accuracy depends on the preparation, authority, training and competence of the author, the methods used to produce the document, the purpose and motives behind

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its publication or production, and circumstances such as pressure of time or from authorities concerned with its production. One may have to check other corroborative sources such as other documents and observers to establish the accuracy of a piece of evidence.

The value of any information depends on its durability or stability, generality, precision and relevance with respect to the idea in the proposal.

### Some General Hints on Literature Review

The researcher should make a comprehensive and exhaustive bibliography even if some of the entries will not be reviewed and used. In that way one can more satisfactorily make choices on what is to be reviewed and what not.

Research is supposed to be an honest enterprise. Thus researchers are expected to follow all the ethical rules, such as acknowledging all sources. There have been cases of plagiarism by very eminent researchers who, as a result, have lost their jobs and had their credibility questioned. Some have even been jailed.

Literature review is not without cost and one should budget for it in terms of both funds and time. You must start as an open-minded, perceptive and critical person, but you also need to know when to stop the review as you arrive at a closure on the substantive and relevant points.

Each entry should be recorded in full. Many researchers waste a great deal of time going back to get full bibliographic references at a later stage in the research. What is needed is an 8" x 5" card for each entry. At the top of each card enter the details of the article. For a comprehensive discussion of citation procedures consult a writers' manual such as *Guidelines for Writers* by I.M. Omari and M.H.Y. Kaniki (Tanzania Publishing House, Dar es Salaam, 1975). Several other manuals exist and one should choose one that has the style to be used in the proposal and in the subsequent report.

## Chapter 3

### METHODOLOGY

#### OPERATIONAL CONSTRAINTS

The section on methodology should be related closely to the problem area, the objectives and the hypotheses on one hand, and operational procedures for project implementation on the other. If the problem area has three related subsets, this calls for three related methodologies or techniques to shed light on each one of them. Likewise, three objectives and hypotheses of a study require three sets of data in order to explain the phenomena under investigation. As far as possible, sufficient data should be collected for each objective or hypothesis, otherwise one may find later that the data relating to a particular section or hypothesis are inadequate.

It is also important to realize that some methods are more powerful, appropriate and cost effective in tackling a given research problem than others. Therefore, one should be familiar with a variety of research methodologies, designs and techniques so as to make a good choice among the possible appropriate methods.

This may entail review of methodological literature so that one is fully conversant with it before proceeding to make a choices. Many studies require the use of more than one method or design, and, indeed, excellent research projects have this characteristic. If possible, a researcher should use the latest techniques so long as these suit the study topic.

Likewise, one has to think ahead as one selects the appropriate research method(s), design(s), and technique(s). The key question one should constantly ask is: "How will it be implemented?" The logistics of implementation should be analysed in close juxtaposition with the design selection process. Here, questions of feasibility in both temporal and spatial senses, affordability in terms of expenses involved, and ethical issues evoked arise. It is only when one can anticipate operational procedures and their associated problems that one can develop contingency plans for handling emergencies and implement a research project smoothly. For instance, if one is interested in the characteristics of

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defaulters and reasons for defaulting from family planning clinics, one has to anticipate problems of residential spatial patterns and temporary migration tendencies among the target populations. Otherwise one may not be able to reach an adequate number of defaulters. In addition, defaulters do not expose themselves easily since they know they have done something "wrong" in the eyes of authorities. How is one going to get them (voluntarily, by coercion, by ambush or any other means)? What kind of information will be divulged to the community before the interviews? Will defaulters hide themselves when they know that a researcher is coming? These are some of the procedural and logistic questions that one keeps on raising as one proceeds to implement a research project. In the natural sciences, the methods anticipated should be realistic in that there is no point in choosing an experimental protocol which cannot be implemented due to paucity of equipment, materials, time or space. Methodologies must be designed to provide measurable parameters.

### SELECTION OF VARIABLES FOR INVESTIGATION

In most scientific studies, one can develop major and minor themes or lines of investigation. When quantification is involved, one has to think in terms of variables and hypotheses to be tested. This is a critical stage as it determines the data base for the study. One has to understand what is going on in the study in question rather than simply reproducing key concepts from other sources. One has to think in terms of key variables which are measurable characteristics that can take different values for specific dimensions. They can be either quantitative (continuous) variables which are measured numerically (e.g. age, height, weight, blood pressure, temperature, humidity), or qualitative (discrete) variables which are measured in terms of categories (e.g. number of males and females, dead or alive, marital status, believers and non-believers).

During the planning stage, the variables in a study have to be clearly identified and their method of measurement as well as the unit of measurement clearly indicated. The validity and consistency of the results may very well depend on the precision with which the variables were measured.

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### **Types of variables**

#### *Independent variables*

These are variables that are manipulated or treated in order to see what effect this has on outcomes or the behaviour of respondents. For example, age changes may result in changes in weight and height. Accordingly, age is an independent variable as changing it, either positively or negatively, leads to changes in the outcomes such as weight.

#### *Dependent variables*

These are variables in which the changes arise as a result of the level or amount of manipulation of the independent variable or variables. For example, high blood pressure may result from increase in weight. Therefore, here, weight acted as the independent variable and blood pressure was the outcome, hence called dependent variable.

#### *Confounding, mediating or intervening variables*

These are variables that should be studied because they may influence or "confound" the effect of the independent variables on the dependent variables. For instance, in a study of the effects of measles on child mortality, nutritional status of the child may play an intervening role and it is thus termed a confounding variable. This is because, while measles is the independent variable that causes high mortality, its effect is more pronounced among children with nutritional problems. Thus:

Independent variable -> Mediating variable -> Dependent variable.

In the case of the possible relationship between weight and high blood pressure, height might be the confounding variable because if one is short and heavy, high blood pressure may be more likely to occur than if one is short and athletic.

Normally the research project objective determines the relationships to be investigated. For example, a study may ask: "Will an increase in the number of female extension workers (the independent variable), affect the quality of farming practices (dependent variable)?" Most research projects fail to capture this key aspect of a study, that is, the relationships between variables or events, and thus they end up as inconclusive descriptions of a phenomenon.

### **Defining your variables**

Certain variables and concepts may not be easy to identify and define. However, the characteristics and parameters that define these variables need to be clearly identified in any given study. In some circles, this is called giving operational definitions of key variables and concepts. This should be done in the context in which the concept is mentioned for the first time rather than listing and defining the concepts separately out of context. For instance, in a study looking at the characteristics of defaulters from family planning clinics, one has to characterize and define the key concept: defaulter.

Very often, technical definitions exist in general and professional dictionaries and publications. Use these and modify them only if necessary so as to retain consistency as other researchers may have used the same definitions and your study will be compared with theirs. Thus, a defaulter may mean one who missed clinic sessions consecutively four times and this should be the universal operational definition of the concept. However, give definitions of the key concepts and variables only. Leave out commonplace words and concepts as these can be easily found in dictionaries.

### **Choosing your variables**

In many studies there may be several variables involved and one has to select only a few of them. The variables selected for study are those which are directly relevant to the objectives and themes of the investigation. The number of variables should be as many as is necessary to explain the problem under study but no more. If too many variables are included for study, the research may become difficult and complex. In addition, it may not stand together to form a thesis which explains a unitary phenomenon. The guiding principle should be the relevance and sufficiency of the variables for tackling the particular research problem being investigated.

### **ETHICAL ISSUES**

The purpose of considering ethical issues in research is to protect human rights and privacy from being infringed by scientific experimentation and to safeguard the credibility of research and the investigators. Infringement of such rights has become more acute during recent decades because of the unprecedented rate and complexity of scientific



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developments in nearly all disciplines. The investigator, in his pursuit of knowledge and technological advance, should consider human rights. Research involving human experimentation should only be done when there is no other way of attaining the required results, and such results should be aimed at benefiting society in general and not just the individual. Difficulties arise when an investigator starts considering how to apply human rights because the rights are not self-evident and in real life are complex. Ethical issues should be considered independently for each research project and no assumptions should be made. Obviously the "end does not justify the means". The various issues relating to ethical matters are discussed below.

### **Consent**

Investigators must ensure that informed consent freely given by the participant is obtained for every research project involving people. Research carried out without such consent is usually considered a trespass on the person because it is direct interference with the person's welfare. Consent for children and mentally sick persons should be sought from the parents or the guardian. The investigators should know that the rights of an individual cannot be decided by the scientific community alone but by representatives and members of societies, for example those to whom results are to be communicated and editors of journals in which the results are published. Therefore, before the investigator makes a decision on such research, he should consult several individuals who are considered to represent a body of informed opinion about what is proper and what is not. When a participant is giving consent, there should be neither influence nor conditions for giving the consent; for example promising rewards or threatening withdrawal of benefits. Investigators should bear in mind that they can be sued in court if they violate the rights of respondents or misuse the findings of their research. Investigators should explain to the participant the nature and effects of what is proposed and should also take into account the participant's level of intelligence and education as well as his physical condition. Such explanations should be given to the participant only by the investigator or other senior members of the research team. The investigator is, however, not duty bound to volunteer information beyond that which is necessary.

### **Moral Issues**

No experimental procedure involving some risk to a human being is permissible if one involving less risk is available. An investigator can justify the use of a procedure only if it does not involve high risk or when there is no other alternative, and only when such a procedure is likely to bring better results than other alternatives available. Examples of such procedures are seen in the medical sciences where a physician is justified in administering a certain type of treatment when such treatment is the only hope of either saving life or restoring health. In controlled clinical trials, an investigator can use participants of full age and understanding with freely given consent as controls to conduct research on new drugs or to prove a point when there is a genuine difference of opinion about the value of a procedure in a particular situation. However, such trials should avoid unnecessary risk and suffering, whether mental or physical. The investigator should not withhold a procedure of proven value from one group and give it to another in his trials. All subjects need to be treated equally.

### **Confidentiality**

The investigator must ensure that confidentiality between him and the participant is maintained. All collected data should be stored in such a way that no unauthorized persons can obtain access to them or identify them with a particular participant.

In the case of computerized data, efforts should be made to separate personal data which should be stored in confidential record formats or in coded form to hide the source. The respondent should have a right to control the amount of data that can be released or stored in a computer. Research records on personal data such as financial sources, family situations and medical records must be considered confidential and should be stored for only a limited and essential period. All participants must remain anonymous unless they have given permission for release of their identity. Results of investigations must never be presented in such a manner that the identification of individual subjects might be possible. A research group should not use, disclose or publish confidential information without permission if identities are obvious.

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### **Conducting Research**

No information collected during research should be distorted because this can lead to misleading information and destroy the integrity of the research in a given field. Investigators must conduct research in such a way as to maintain the integrity of the research enterprise and not to diminish the potential for conducting research in the future. Such integrity can be maintained only by the researcher being honest to the participants and those receiving the results. Decency in research calls for provision of adequate facilities, application of competence, and use of qualified personnel in a project. There should be no bias in the design, conduct or reporting of the research. If deceit is used as the only means of studying the problem, then the investigator has the obligation to explain to the participant the need for deceit. However, if the deception cannot be revealed for human or scientific reasons, then the investigator has to protect the interests and welfare of the participants. Answers to participants' questions in such situations can be evasive but should not mislead the participant.

The use of rare and/or endangered species in research should be allowed only when there is no alternative way of getting the desired information. The research should be conducted by responsible researchers and be in the national interest, and the results must be for the benefit of society and not for an individual. Use of rare species must stop immediately if an alternative method of conducting the research is found.

### **POPULATIONS AND SAMPLING**

#### **The Study Population**

During the planning stage, the researcher needs to define the population. It is imperative to specify clearly which group is going to be investigated. A population consists of all the cases of individuals or things or elements that fit a certain specification. Thus one could talk of the population of secondary school leavers of 1985, of single women between 15 and 49 years, of shoe-shine boys, or any other specified group of people.

A population may be divided into sub-populations or strata. These are mutually exclusive groups such as men and women or males within a certain profession or age group, or females with passes in mathematics. In some cases, these could be

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regarded as separate populations, but for some purposes it is convenient to classify each as a stratum or part of a population.

Every case in a population is called an element. If the study population comprises cases of a certain characteristic, the procedure to be used for identification of each case should always be stated. It may seem a simple matter to identify the study population. For example, residents of an estate in a particular city or students at a certain university can easily constitute populations. However, quarter specification is often required and care must be taken such that results claimed to represent a certain population actually do so. Thus it is pertinent to ask: what is meant by a city? If this is defined by size of population, what cut-off points should be used to define the population? Should the study be confined to the official city boundaries or the natural boundaries. Should it include the peri-urban areas?

### *Selection of the Study Population*

Sometimes it is possible to detect from the topic of investigation what type of population should be chosen. In other instances, however, particularly when an analytical survey or experiment is to be conducted, the investigator could resort to a purposeful selection of the study areas and populations. In doing so, notions of appropriateness and practicability should be considered. Appropriateness of the study population refers to its suitability for achieving the objectives of the study. Therefore, this consideration takes precedence over practicability.

### *Sampling*

#### *Definition*

Sampling is a procedure by which some elements of a population are selected as representative of the total population. The main aim of the selection is to make observations or measurements of these elements and make conclusions regarding the entire population.

Sampling does not merely entail a simple selection of a few members of the population as a substitute for all its members. Essentially it involves the use of probability theory to acquire a demonstrable degree of reliability and validity in the selected cases of the population. Here there are scientific procedures for achieving this goal.

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### *Rationale for Sampling and Issues to Consider*

Due to financial, physical and social constraints, researchers often resort to obtaining information about only part, or a sample, of the population which is to be investigated. Sampling has the added advantage of making better use of available resources because it achieves the same research objectives with reduced resources. Sample results are confidently used for generalizations about the parent population from which the sample is selected. Statistical techniques have been developed and these make it possible to state the precision and confidence with which such generalizations can be made. In general the following issues are important in sample selection.

- The sample should be representative of the parent population. This is achieved by the sampling techniques available.
- The sample must be sufficiently large. When several representative samples from the same parent population are taken, the problem of sampling variation can be assessed. Such variations are minimized if the sample is large enough. However, there is no magic ratio for sample size to parent population. On the whole, the "larger the better".

### *Types of Sampling Strategies*

It is important that a researcher should be familiar with the various strategies so that one can choose one that meets the demands of the study. Textbooks elaborating these are available (see Bibliography) but the following is a summary.

#### *Probability Samples*

These involve the use of statistical theory in the design of an empirical study and the selection of the sample. This type of sampling is unbiased and facilitates making valid conclusions about the population from which the sample is selected.

#### *Purposive (Subjective) Sampling*

This involves selection of a sample based on judgement and knowledge. It is, therefore, biased but achieves the purpose of the study. It is important that one should have some idea about the nature of the biases built into this strategy.

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### *Convenient (or Chunk) Sampling*

This type of sampling uses a sample that is handy. It is, therefore, necessarily biased. For example, a survey based on telephone owners is convenient for a researcher, but telephone owners necessarily belong to a certain upper class and live in certain residential areas.

### *Random Simple Sampling (RSS)*

This method gives every element of the population an equal chance of being included in the sample. A sampling frame which lists all the population elements is compiled and the sample is then drawn from it. If the population is large, this method would be tedious. Therefore, a table of random numbers from a statistics textbook may be used instead. Each element is given a number and those numbers selected from the table of random numbers are included in the sample.

### *Systematic Sampling*

This technique involves starting at a random point on the list (established by flipping a coin or using a random number) and taking every  $n$ th element from then on to the end of the list. For example, if the sample is to include one sixth of the population, then every sixth element is chosen from the entire list for inclusion in the sample. This is also called quasi-random sampling because once the first individual has been chosen the rest do not have an equal chance of being in the sample.

### *Stratified Sampling*

It has already been intimated that a simple random sample may turn out to be unrepresentative of the population. This can arise especially if the sample is small and is drawn from a large population. Stratified random sampling is, therefore, preferable. This method caters for various strata of the population so that each is included in the sample in sufficient numbers and thus their responses can be divided into strata on the basis of such variables as age, sex, education, residence, and so on, depending on the focus of the study. Basically, stratification uses the researcher's knowledge of the population in order to increase the representativeness of a sample. Two key factors should be kept in mind during the stratification process: maximize variation between groups and minimize variation within

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groups. Thus, strata that are likely to show important differences in the dependent variables should be chosen. For example, men and women are likely to have drastically differing views on some aspects of life. But generally, men may differ slightly among themselves. So stratification could be done along general lines.

### *Cluster Sampling*

In cluster sampling, groups of individuals of similar characteristics are selected. This means that the sampling units are clusters or groups and therefore the sampling frame will be made up of lists of clusters or groups. Such clusters or groups could be villages, classes in a school, families or ecological zones. Then these groups are studied in great detail like case studies but no generalizations can be made about other clusters as their differentiating characteristics are not known.

## RESEARCH DESIGNS

In choosing research designs, two factors need serious consideration, especially when experimental designs are to be used. These factors relate to internal and external validity. Different types of design are shown in Figure 1.

### Internal Validity

Internal validity is the basic minimum without which any experiment will become uninterpretable. The question asked here is whether, in fact, the experimental treatments make a difference in causing the observed results.

### External Validity

On the other hand, external validity raises the question of generalization of findings. In other words, to what populations, settings or treatment variables, can this effect be generalized? While internal validity is the same *sine qua non*, it is sometimes at odds with external validity. Designs which are strong in both types of validity are obviously the ideal. While these issues are more important in experimental designs, the thinking embodied in them permeates all research activities. Advanced research textbooks in each discipline may be consulted for clear understanding of their applications. Likewise, the variety of research designs and

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how they handle these two concerns are well treated in texts such as Kerlinger (1964) and Isaac and Michael (1972).

### *Factors in Selecting the Method of Data Collection*

The choice of methods of data collection is largely based on the efficiency and accuracy with which the information will be collected. The question is the extent to which the method will provide precise and adequate data on variables the investigator wishes to study.

The selection of a method is also based on practical considerations, such as:

- The need for personnel, skills, time, equipment and other facilities, in relation to what is available;
- The acceptability of the procedures to the subjects -- the absence of inconvenience, unpleasantness, or undesirable consequences.

However, accuracy and "practicability" are often inversely correlated. A method providing more satisfactory information will often be more elaborate, expensive and inconvenient. Clinical examinations provide more accurate information on chronic diseases than do interviews, but they are more expensive and require medical or paramedical personnel to execute and are less acceptable to the subjects and hence associated with a low response rate. Accuracy must be balanced against practical considerations. In making the choice, account must be taken of the importance of the information, in the light of the purposes and objectives of the study. If the information is not very important, a simple although less accurate method may suffice; if more accurate information is essential, the use of an elaborate or inconvenient method may be unavoidable.

Information on the accuracy and practicability of the proposed methods can often be obtained from previous methodological studies or from experiences in other investigations. In reading the literature on the study topic, the investigator should pay special attention to methodological aspects. In some instances it may be possible to find articles or books dealing specifically with methods of study.

Usually, however, it is necessary to pretest the methodology, or at least some of the projected methods. It may be necessary to determine, for example, how long an interview or examination will take, how acceptable it is, whether



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questions are clearly intelligible and unambiguous, or whether the requisite data are available in clinical records. This is the essence of a pilot study.

### PROCEDURES FOR DATA COLLECTION

There are many methods of collecting data. This section discusses some of them, but again advanced texts should be consulted for details on each of them, as appropriate.

#### **Questionnaire**

This is a formatted set of questions that is drawn up to meet the objectives of the survey. The key factor in the construction of questionnaires is relevance of the questions to the goals of the study and to the individual respondent. It is important that care be taken to decide on how answers will be analysed before including an item in the questionnaire. Questions should be clear and categorical. Subsequent follow-up, open-ended questions should be treated separately.

#### **The Interview**

The interviewer asks questions tailored to the achievement of the objectives of the survey. Some interviews are structured and some can be unstructured, depending on the focus of the study. The strength of an interview lies in its flexibility, ensuring a high rate of response, control of the interview situation, recording of spontaneous and unintended responses, and one can prevail upon the respondent to complete all questions. However, interviews can be expensive, reach only a few cases, are time-consuming, inconvenient to the respondents, can carry the biases of the researcher, and when there are many interviewers standardization of the stimuli is difficult.

#### *Interview Bias*

Interview bias can arise out of the interviewer's reaction to sex, social class, age or even dress.

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### **Less Standardized Work**

If many interviewers are involved, the questions will not be asked in a standardized way.

### **Participant Observation**

This method requires the investigator to be involved in the respondents' activities in order to gain insight and be able to observe certain factors required for the investigation. For example, a researcher seeking to find out the behaviour patterns of an ethnic group could decide to live among the group for a period of time. He will, thereby, gather the data over a specified period. Sometimes observations could entail clinical examinations which may require equipment of various degrees of sophistication.

### **Experimental Observation**

This method involves the manipulation of certain factors and variables in the environment until an observable effect is produced. This technique is often applied in the physical and natural sciences in laboratory situations, but such experiments are also quite common in fields such as sociology, law, psychology, agriculture and history.

### **Other Methods**

Sometimes information is obtained from documentary sources such as diaries, published statistical bulletins, medical records, textbooks in libraries, remote sensing, slides and tapes.

## **DATA ANALYSIS PROCEDURES AND INTERPRETATION**

### **Processing the Data**

During the proposal writing stage, the researcher should decide, at least in broad outline, how the information he proposes to collect will be analysed. It is often helpful to draw up a number of specimen tables (dummy tables) showing the classification of the variables, and to consider how different kinds of results will be interpreted. This process of "projection" of the analysis often reveals gaps in the data sets (e.g. omitted variables, lack of information on the

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denominator population, defects in scales of measurement, and superfluous data). It provides a further opportunity for second thoughts as to whether the study, as planned, is likely to meet its objectives. Statistical tests to be used should be spelt out as this will indicate the strengths and weaknesses of the conclusions to be made and the appropriateness of the data.

To avoid problems, all dummy tables should be clearly labelled. This applies to work sheets in which figures are written following hand tallying or manual or mechanical card sorting, to computer outputs, and to tables produced later as summaries or elaborations of the data. Labelling is important, even if the table is only for one's own use. Often researchers forget what the data in the table mean if there is no labelling of the columns, rows and headings.

Variables should be spelt out, and their scales of measurement explicitly stated. All this information may or may not come ready-printed in computer outputs; if it appears in a shorthand form, the investigator should ensure that it can be recorded.

Figures should be checked whenever possible, even if they come from a computer. Totals and marginal totals can usually be compared with known figures from previous tables. Sometimes errors are shown by the fact that the figures "do not make sense". All arithmetic should be checked and verified.

## **Performing the Analysis**

The detailed analysis plan must obviously depend upon the objectives of the study and expertise available. No hard and fast rules can be laid down for the sequence of the analysis. However, each variable should be examined separately and then in the context of others. It is usually advisable to start the analysis by examining the frequency distributions in all variables. That is, a separate table is prepared for each variable, showing how many individuals fall into each category or at each value of the variable. This information may influence decisions about subsequent steps in the analysis. Plans for detailed studies of relationships between social class and illnesses, for example, may have to be abandoned if the study population turns out to be very homogeneous in social class. If there are an excessive number of individuals in an "unknown category", it may be decided that the variable cannot be studied. However, peculiarities in distribution may throw doubt on the accuracy of the data.

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It is best to use detailed scales of measurement at this stage. That is, use narrow categories, with little or no "collapsing" so that the frequency distributions can provide a basis for decisions about the categories to be used in subsequent stages. Simple indices that summarize frequency distributions, such as means, percentages and rates, may be calculated at this point. A major part of the analysis usually involves pairs or sets of variables rather than single variables. Even in the simplest descriptive survey, the investigator may want to look separately at the findings by sex and age group.

In seeking evidence of association, emphasis is given to those which the study was designed to investigate; that is, the associations that are specified or implied in the stated objectives of the study. The process of examining a body of data in order to determine which variables are associated with one another may be referred to as "screening" for association.

Simple methods may suffice to reveal associations between pairs of variables. A relationship between pregnancy and anaemia, for example, may be revealed by a contingency table (cross-tabulation) in which each woman is simultaneously classified according to her pregnancy status and the presence or absence of anaemia.

Complex methods are available which permit the simultaneous examination of relationships involving a number of variables. These techniques of multivariate analysis require considerable statistical expertise and statisticians should be consulted quite early in the design so that problems can be anticipated.

Often a computer is used in the analysis of data. Programmes may be tailor-made by a computer programmer or obtained from a ready-made programme package. Therefore an expert in computer applications also needs to be consulted early so that programmes can be ordered, made or adjusted.

The investigator may not be able to make his own computer programme, but if he is to explain his needs adequately to a programmer, he should know what kinds of output are desired so as to answer the research questions. The computer man or the computer itself will not know how the data are to be used. The researcher has to be clear on this first.

## Chapter 4

### BUDGET AND WORKPLAN

#### BUDGET

The budget portion of a research proposal sets out the financial resources required for implementation of the project. It ensures that the necessary personnel, equipment, materials and associated services will be available for the entire life of the project. The budget is also a managerial tool for planning and monitoring in order that the desired goals and objectives are attained. If the budget is to serve as an effective management tool, it must be prepared with the utmost care and thoroughness. It is crucial that a researcher should be familiar with the costed inputs which can be provided by the funding sources and the host institution.

The following are some of the items which are often budgeted for:

- Personal emoluments such as salaries, gratuity and consultancy;
- Transport, accommodation, travelling;
- Operation and maintenance of equipment;
- Purchase of inputs such as fixed assets (typewriters) or expendable supplies (stencils, paper, typewriter ribbons, etc.);
- Conferences, workshops, seminars and meetings;
- Secretarial services;
- Training, fellowships and scholarships;
- Equipment such as vehicles, typewriters; field and laboratory;
- Printing, reporting and publication; and
- Library and literature.

Research budgeting often focuses on recurrent expenditure. However, sometimes one may be required to plan for and cost capital items, which may include:

- Buildings, renovations and hiring;
- Purchase of plant equipment;
- Construction of structures; and
- Infrastructure such as roads.

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While preparing a budget, it is vital to check and be familiar with the policies of the funding agencies and recipient institutions with regard to:

- Items which can be provided locally;
- Items which cannot be purchased;
- Expenditure costing on each item;
- Availability of funds in local or foreign currency;
- Foreign exchange regulations;
- Customs and duty on items likely to be imported;
- Insurance, taxes and discounts, and
- The accounting systems of the donor agencies and recipient institutions.

The steps in the preparation of the budget should proceed in the following sequence:

- Study the sequence of the research activity or workplan and tally the budget accordingly;
- Estimate the cost of each activity;
- Group similar expenditure items together;
- Allow for inflation;
- Prepare a detailed periodic budget; and
- Present a budget summary covering all years of the project.

### **Estimating Costs for Each Activity**

Estimating costs is crucial because it determines the appropriate level of project funding. This is a painstaking but essential process which ensures that relevant costs are not overlooked or under estimated. For example, if salaries, supplies, and travel are improperly costed, the project may suffer serious financial difficulties. The types and qualities of materials and services must be determined for each activity listed. One way of doing this is to use an activity sheet. In this system, each activity is listed individually in the order in which it appears in the activity sheet, with each activity having its own cost estimate.

The cost components should be worked out accurately and the unit costs or rates determined appropriately. For instance, personnel requirements should identify the type of people needed, qualifications and rates of pay which should be based on negotiation rates. Travel, whether local or foreign, should identify the possible places to be visited, number of visits planned, subsistence allowances and mode of transport envisaged. With regard to equipment and materials, one must use the latest catalogues. In general, the estimating

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exercise should quantify the various activities by identifying the specific costs and establishing quantities and unit prices based on reliable data, particularly pertaining to models. At this juncture, the researcher will be forced to travel and visit stores for supplies, and to talk to finance officers, purchasing officers and other organizations to ascertain the costs.

It should be noted that some expenditures cannot be allocated easily to specific project activities. For example, salaries of regular project personnel, rent and utilities may be estimated for the whole budget period rather than for each project activity. Some donors require that a counterpart contribution such as personnel time, space, secretarial services, or transport be costed and provided separately.

Lastly, it is important to use the established account/budget headings. Accounting and reporting on project expenditures during the implementation stage are greatly facilitated if common or previously agreed headings are used. In most cases, each sub-heading is assigned a code or a number.

Some hints on the budget:

- A budget is subject to periodical revision;
- Be clear on who is authorized to incur expenditures on each and every project;
- Who is responsible for accounting for the project;
- What are the reporting dates;
- The total sum covered by the budget may not be available at once;
- Note conditions of reporting which affect cash flow;
- It is important to keep budget notes on each item for future reference;
- Anticipate items which may require foreign exchange and make appropriate provisions; and
- Ensure that you are familiar with the budget code for each project.

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## An Example of a Detailed Budget in Kenya Pounds

### A. RECURRENT BUDGET

1. <u>Staff</u>	Number	1987/88	1988/89	1989/90	1990/91	1991/92
Research officers	3	3,144	9,564	10,060	10,456	11,052
Field officers	2	2,010	4,092	4,136	4,598	4,758
Technicians	1	2,010	2,082	2,154	2,244	2,334
Laboratory assistants	3	1,728	2,664	2,722	2,880	2,988
Field assistants	4	1,800	1,872	3,744	3,960	4,104
Field clerk	1	-	936	972	1,008	1,044
Grade staff	8	978	1,998	4,050	4,206	4,374
Manual workers	10	2,250	4,050	5,760	6,920	8,300
<hr/>						
Sub-total + 20% hidden costs	32	16,704	32,710	40,276	43,518	46,740
<hr/>						
2. <u>Upkeep</u>						
Stationery, bactericides )						
Repair of equipment, )						
services )						
Protective clothing, )		50,000	65,000	70,000	75,000	90,000
Petrol/oil for spraying )						
machines, other )						
materials for field work)						
3. <u>Transport &amp; subsistence</u>						
Maintenance, insurance )						
Repair of vehicles, )		60,000	65,000	70,000	75,000	90,000
Subsistence for staff )						
<hr/>						
Sub-total		110,000	130,000	140,000	150,000	180,000

### B. CAPITAL EXPENDITURE

1. Standard meteorological )
- station composed of )
- raingauges, Stevenson's )
- screen + thermohygrograph)
- min./max. thermometers,)
- evaporation pan, )
- cup-counter anemometer )
- sun recorder, Gan )
- Bellani radiation )
- integrator )

20,000



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### Example budget (cont)

<u>2. Housing</u>		<u>Units</u>					
Senior staff	6	100,000	50,000	-	-	-	-
Junior staff	8	20,000	10,000	10,000	-	-	-
Grade staff	8	4,000	4,000	8,000	-	-	-
Manual workers	10	10,000	6,000	4,000	-	-	-
3. Laboratory expansion							
to double current size		20,000	-	-	-	-	-
4. Field block complex 1		40,000	-	-	-	-	-
<u>5. Purchase of vehicles</u>							
Lorry (7 ton)	1	25,000	-	-	-	-	-
Land Rover	1	-	25,000	-	-	-	-
Motor bike	1	-	1,500	-	-	-	-
Bicycles	2	-	300	-	-	-	-
<u>6. Laboratory equipment</u>							
Centrifuge	1	5,000	-	-	-	-	-
Incubators	2	2,000	-	-	-	-	-
Oven	1	2,000	-	-	-	-	-
Refrigerators	2	2,500	-	-	-	-	-
Controlled Environ Chamber	1	5,000	-	-	-	-	-
Autoclave (80 l)	1	10,000	-	-	-	-	-
Glass-house	1	10,000	-	-	-	-	-
<u>7. Field equipments</u>							
Thermohygrographs	4	4,000	-	-	-	-	-
Min./max. thermometers	10	250	-	-	-	-	-
Stevenson's screen	6	1,000	-	-	-	-	-
De Wit wetness records	4	4,000	-	-	-	-	-
Motorized sprayers	6	4,500	-	-	-	-	-
Sub-total		289,750	98,800	22,000	-	-	-
C. <u>SURVEY</u>							
Transport )							
Subsistence )		10,000	-	-	-	-	-
D. <u>COLLABORATION</u>							
Transport, Equipment		10,000	-	-	-	-	-
E. <u>CONSULTANCY</u>							
Transport )							
Remuneration )		5,000	5,000	5,000	5,000	5,000	

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### Example budget (cont)

#### F. STANDING COMMITTEE

Sitting allowance )					
Subsistence )	2,000	2,000	2,000	2,000	2,000
Mileage )					

#### G. TRAINING

Short-term seminars	6,000	6,000	-	-	-
Long-term:					
(i) 8 man-years Ph.D.	50,000	50,000	-	-	-
(ii) 6 man-years M.Sc.	10,000	10,000	10,000	-	-
Conferences (Kenya)	-	40,000	-	-	-
Conferences (Overseas)	2,600	6,600	-	-	-

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TOTAL	512,054	385,110	229,276	210,518	243,740
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### WORKPLAN

Very often researchers do not reflect on the tasks and processes involved in the implementation of a research project. However, this planning step is essential if the project is to be carried out smoothly and efficiently.

### Definition

There are three steps in the project planning process. These are:

- Analysis of tasks;
- Time estimates of the plan;
- Synthesis of the plan.

### Analysing Project Tasks

In the planning process, the project is broken down into its smallest discrete components for the following two reasons:

- It is possible to make more accurate estimates of the time and cost of the project if it is broken down into smaller units of technical activity.
- It becomes easier to monitor and control the progress of the whole project (which is a management activity that follows planning on the basis of small units of technical activity).

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Analysis of any project activities involves grouping them according to the following characteristics:

- Technically discrete;
- Temporally discrete;
- Financially discrete;
- Will yield discrete results.

Technically discrete means that this component of the project involves an easily distinguished activity in the whole set-up, and temporally discrete means that the component is easy to isolate in time. A financially discrete component is one that has a relatively stable and easily calculated cost. Discrete results are obtained when the particular project component is completed with the predicted results. In planning language, these results are frequently called "deliverables".

### **Estimating Time and Costs**

The second task in project planning is estimating the time and costs required for each component of the project. Notice that the components (called "tasks") identified in the first planning step serve here as the objects of time and cost estimates.

### **Synthesizing the Plan**

This is simply a matter of using particularly graphic symbols to depict the sequence of all project tasks, with their respective schedules and resource requirements and their interlinkages. This is the central part of the project plan. Armed with such graphic plan a research manager can anticipate when a particular task will be carried out and how much it will cost. The plan gives the researcher the ability to control the technical, time and cost performance of the project. Synthesis means pulling diverse parts together and creating a representation of the whole. In the case of project planning, this phase recreates the project, highlighting all its technical phases, deliverables, timing and resource requirements. There are many graphic tools available for this purpose. Here are some of them and their fields of application:

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### Techniques or graphic tools

- (a) Task lists
- (b) Bar charts
- (c) Deliverables chart
- (d) Critical path method
- (e) Programme evaluation and review techniques

### Application

Research project  
Research project  
Technology development  
Construction  
Development Project  
Implementation

### **Conclusion**

The choice of any technique will depend on how much the researcher wants from it. It could provide just a quick picture to discern slip-ups or it might show up budgetary overruns or certain slacks that are crucial in the overall operation of the research project. It could also be a significant project monitoring and management tool. An example of a bar chart is given on page 44.

### **OUTPUT OF RESEARCH**

All research, whether basic or applied, should, in the long run, enhance the welfare and dignity of man. All applied research, especially in developing countries, should also have as its immediate focus the solution of developmental problems. Therefore, research projects should be designed with a clear view regarding outputs, dissemination modalities, techniques and the potential uses of the products. If necessary, utilization routes and mechanisms should be stipulated too.

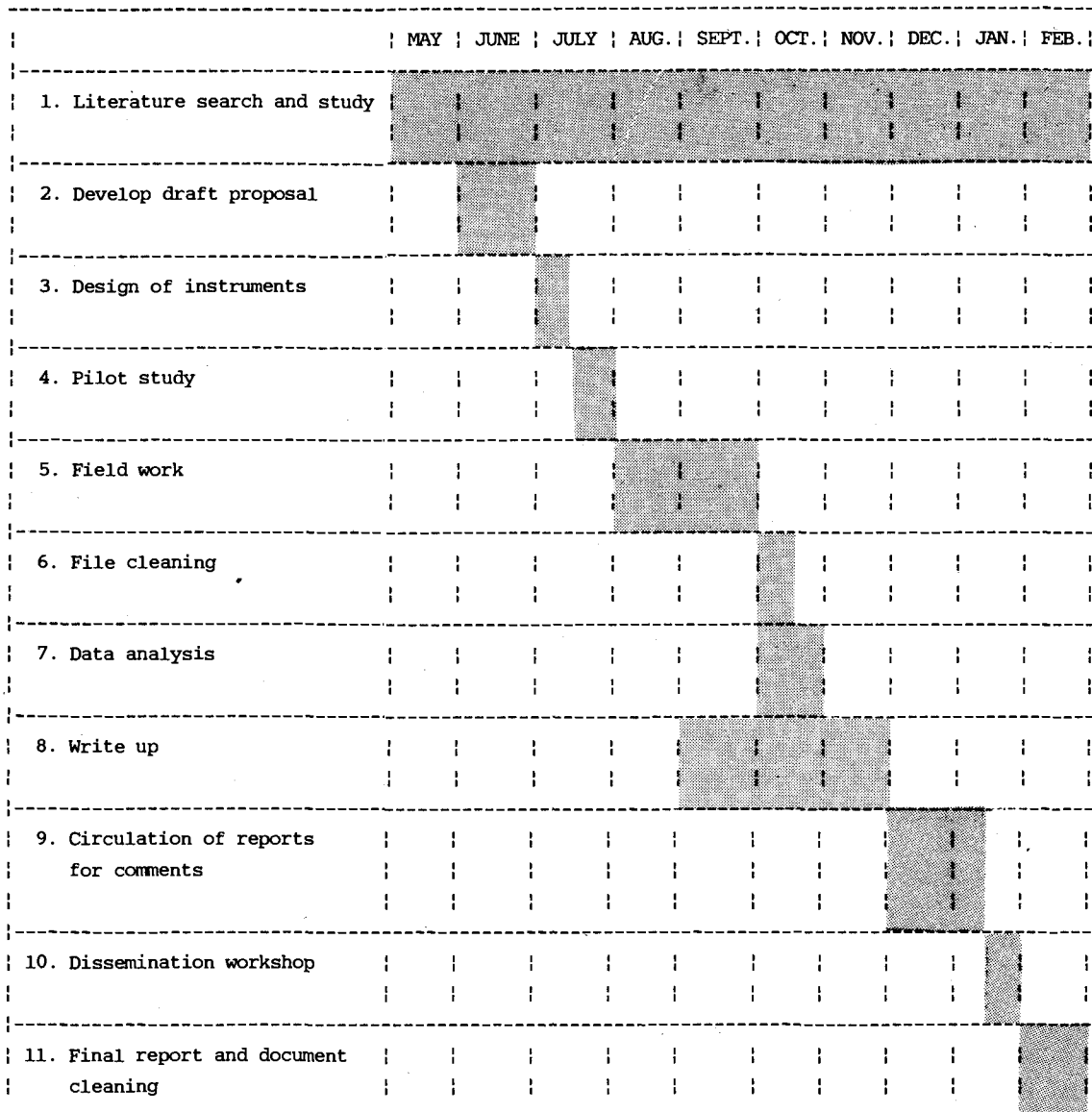
There are two main types of research output. First, is new knowledge about a phenomenon. One has to be sure that the finding is an unequivocal one that can stand (in relative terms) the test of time and replication.

Second, are new technologies such as inventions of new farm and food-processing equipment, health products (e.g. vaccines) and seed varieties. These have to go through a series of tests to be confirmed as useful tools and products for incorporation into national developmental activities.

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### Bar chart approach to synthesizing a ten-month research project plan

Project title:



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Most funding agencies look very closely at proposals to satisfy themselves that the outcomes of research will be genuine and relatable to currently compelling developmental problems. It is important that the researcher should anticipate the outcomes of the research project. Some research outputs may have deleterious side effects. It is incumbent upon the researcher to probe these carefully as he is as much responsible for these effects as for the desired ones. Many discoveries in the medical and agricultural fields have disastrous side effects. For instance, chemicals which kill weeds may also kill insects which are essential for maintaining a balanced ecosystem. Likewise, some drugs, though beneficial when used against a particular disease, may suppress the function of the body's immune system thus making the patient more vulnerable to a variety of other infections.

### **INSTITUTIONAL CAPACITY**

The institution at which a research project is to be conducted is an extremely important element. The credibility and capacity of an institution should not be assumed but must be described in a manner that leaves no doubt in the minds of any potential funder regarding its capacity to handle the project. It is useful to provide a brief historical setting of the institution. Such an account should give an up-to-date description of the infrastructural and physical as well as the material and human resource base. The areas of strength and specialization should be highlighted, including its research mandate, its policies, and current and previous activities. Any comparative advantage which an institution may have in the way of providing continuity for the project beyond the prescribed phase ought to be mentioned. Similarly, avenues for dissemination of research results through the institution and outside should be highlighted, including institutional interlinkages which can foster collaborative efforts.

In the final analysis, it is the institution and the researcher who are accountable for the failures and successes of a project. Where necessary, separate brochures (if available and not too bulky) may be attached to the project proposal.

The principal investigator ought to guide the donor on what his/her institution is or is not capable of undertaking or providing. In no way should the investigator commit the home institution morally and financially before clearing with the

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relevant authorities. Counterpart contributions, in the form of staff, time, facilities and other resources should be estimated and costed and apportioned to the project accordingly. On the other hand, where an institution levies a service charge on projects, this must be budgeted for and shown.

The competence of the technical staff to handle the project can only be evaluated on the basis of the curriculum vitae of the principal and co-investigators. Some funders require that all C.V.s of all the co-operating researchers be attached. On the other hand, a summary giving professional capabilities of the individual may suffice. Such a resume ought to focus on the abilities of the persons to implement/execute the research project in question. The C.V. should not be too lengthy or too brief. A good C.V. should reflect responsibilities and achievements relevant to the project at hand. The essential elements of a good C.V. are provided in Appendix 4.

## **DISSEMINATION AND UTILIZATION OF RESEARCH RESULTS**

More often than not dissemination activities are neglected in research proposal formulation, including the budget. Yet in applied research dissemination activities are an integral part of the research process. Most research scientists are interested in publishing their research results in reputable journals so as to inform their peers of the new discoveries and lines of thinking. As much as this is a noble goal, and the safe route for academic advancement, it is important that researchers should think of the variety of possible audiences in addition to the readers of the international journals and their peers.

In the realm of applied research, the scientist should have the following categories of scientists in mind:

- Peers and other senior scientists in the field;
- Policy makers and other senior executives interested in the field;
- Final consumers such as farmers in the field and teachers in the classroom; and
- Funding agencies.

The different audiences may indeed determine the manner in which the message is written and packaged for dissemination. These categories of audience can also be differentially

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involved in the research processes and activities. Indeed it is a misdirection to think that dissemination comes at the end of the research process. Unless involvement of the consumers of the research results will compromise the standard and legitimacy of the research process itself, they should be involved right from the identification of the research problem and the search for its parameters. Thus a problem-identification seminar involving key farmers and policy makers is a legitimate dissemination-sensitization activity to be undertaken before the project starts. However, there are several dissemination strategies. They include:

- *Progress reports*, both verbal and written, which can be scheduled in the research protocols. These reports could start quite early, including a problem-identification seminar to give legitimacy to the activity; a project development workshop; a launching seminar; interim report seminars; and a final report seminar. All these are useful dissemination exercises, but the researchers should guard against raising false expectations. It should be noted that one learns to make adjustments to improve research activities as one gets feedback from colleagues and consumers during workshops which report progress. The final report is more wide ranging and hence forms a summative report. Progress reports should be based on field visits and anecdotes and should be considered as formative evaluative reports.
- *Films, charts*, and other visual aids can be useful for dissemination to a less literate clientele;
- *Executive summaries* are aimed at policy makers, senior executives and funding agencies;
- *Personal communication* (long letters and memos) to key individuals such as senior researchers and directors in related fields;
- *Formal articles in scientific journals*;
- *Formal articles in popular newspapers and magazines*;
- *Special brochures and fliers*;
- *Articles in books*;
- *Books*.

Some important matters to be taken into account as part of the dissemination strategies are:

- If dissemination leads to adoption and utilization of the knowledge and technology, what will be your role and what follow-up activities should be designed?
- Do not report unconfirmed results unequivocally. Patience and modesty need to be exercised so as to protect both researchers, consumers and the research enterprise in general.



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- If a country requires clearance before publishing the research results, what will be your position *vis-à-vis* the political system?
- Do you have facilities for the production and dissemination of research results and are these budgeted for?

## Appendices

### Appendix 1. ANNOTATED BIBLIOGRAPHY

This bibliography lists selected works in the area of research and proposal formulation which will be helpful to those interested in further reading as they develop their proposals and research interests.

Abramson, J. H. 1983. *Survey Methods in Community Medicine*. Edinburgh: Churchill Livingstone.

Provides a simple and systematic guide to the planning and evaluation of investigations concerned with health and disease. The book is relevant to medical professionals wishing to undertake research.

Altick, R. D. 1963. *The Art of Literary Research*. New York: Norton.

Provides a comprehensive account of the problems of literary research, with chapters on finding materials, making notes and composition.

Barker, D. J. P. and Bennett, F. J. 1983. *Practical Epidemiology*. London: Churchill Livingstone.

This is a practical manual of epidemiology for doctors and medical students in developing countries. It gives details and the sequence of an epidemiological study.

Barker, D. J. P. and Rose, G. 1976. *Epidemiology in Medical Practice*, Edinburgh: Churchill Livingstone.

This is useful to those wishing to undertake research in the field of medicine and health, introducing data and methods used to describe disease in the community and the application of epidemiology in the discovery of causes of diseases. It gives an account of four aspects of patient care which require our understanding of epidemiology: screening, prognosis, epidemics, and the evaluation of medical services.

Borg, W. R. and Gall, M. D. 1971. *Educational Research: An Introduction*, 2nd edition. New York: Mickey.

This takes the student through the entire research process, from choosing a project to writing the thesis.

Clark, G. K. 1967. *The Critical Historian*. London: Heinemann.

This book is of relevance to those wishing to carry out historical research. It discusses the methods of historical research, analyses ways in which evidence is built up and

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compares the nature of historical proof with that of other disciplines.

Fox, D. J. 1968. *The Research Process in Education*. New York/London: Holt, Rinehart and Winston.

Provides a comprehensive explanation of each stage in the research cycle, and gives the student a thorough grounding in concepts, methods and techniques, including electronic data processing.

Good, C. V. 1972. *Essentials of Educational Research: Methodology and Design*. 2nd edition. New York: Appleton-Century-Crofts.

Provides an outline of research methods based on discussion of concepts, principles and procedures, with many examples from psychology and sociology as well as from education.

Isaac, I. and W. B. Michael. 1972. *Handbook in Research and Evaluation for Education and the Behavioural Sciences*. San Diego, California: Editts Publishers.

This is a collection of principles, methods and strategies useful in the planning, design and evaluation of studies in education and behavioural sciences. The book is useful as a pool of guidelines, methods and techniques or research design, measurement and statistics not ordinarily available in a single volume and gives the pros and cons and application of each research design and approach.

Jones, E. T. 1971. *Conducting Political Research*. New York/London: Harper and Row.

This book is intended for students without training in statistics. It covers research design, measurement, sampling, data collection, coding, data analysis and statistical inference.

Kerlinger, F. 1964. *Foundations of Behavioural Research: Education and Psychological Inquiry*. New York: Holt, Rinehart and Winston.

This is a large volume on scientific behavioural research. Its major purpose is to help researchers understand the fundamental nature of the scientific approach to problem solution and the complexity of research design and processes in a very imaginative way. Suitable for advanced students.

Peil, M. 1986. *Social Science Research Methods: An African Handbook*. London: Hodder and Stoughton.

This is a comprehensive and detailed introduction to research methods for social scientists. It covers studies done in a developing country with examples of the

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difficulties posed by illiterate respondents, houses without numbers, the multiplicity of languages, polygamous marriages, and so on.

Salmon, S. C. and Hanson, A. A. 1964. *The Principles and Practice of Agricultural Research*. London: Leonard Hill. This book provides a comprehensive survey of methods and techniques used in agricultural research. It is designed for those actively involved in field work but could also be of use to students of agriculture.

## Formulation of Research Project Proposals

### Appendix 2. SOME POTENTIAL SOURCES OF RESEARCH FUNDS

This list gives the names of some international research funding agencies. It is by no means exhaustive as there are some development and donor organizations which fund research as part of development programmes in third world countries and local institutions such as research councils and universities which also fund research and should be considered in applying for research funds.

#### A. Global research organizations

Name and address	Domain of interest	Comments
1. Ford Foundation 320 East 43rd Street New York, N.Y. 10017 Tel. (212) 573-500 Regional Office for East and Southern Africa P.O. Box 41081 Nairobi, Kenya	Social sciences, agriculture, law, fellowships and awards	Submission of the proposal can be made any time of the year to the Resident Representative. An initial submission of concept proposal is required. Subsequently provide as much detail as you can, including budget.
2. International Development Research Centre (IDRC)  <u>Headquarters</u> 60 Queen Str. Ottawa, Ontario, Canada, King 3HQ Tel. (613) 236-6163 Telex 627095  East African Regional Office, P.O. Box 62084 Nairobi, Kenya Telex 23062 Tel. 330850	- Health sciences - Agriculture & nutrition - Social sciences - Fellowships and awards - Communications	- Funds research projects within these areas - Information sciences - There are no application forms, no dates for submission and proposals are submitted to regional offices.
3. W.K. Kellogg Foundation 400 North Avenue Battle Creek Michigan, 49016, U.S.A. Tel. (616) 965-1221	- Agriculture - Health - Education	No application forms. Proposals to the Secretary of W.K. Kellogg Foundation any time of the year

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### A. Global research organizations (contd)

<p>4. The Rockefeller Foundation 1133 Avenue of Americas New York, N.Y. 10036 U.S.A.</p>	<p>- Social sciences - Population - Health</p>	<p>Applications can be submitted any time of the year to the Resident Representative. There are no ceilings to the grants.</p>
<p>Regional Office P.O. Box 47543 Nairobi, Kenya</p>		
<p>5. Swedish Agency for Research Co-operation (SAREC) c/o SIDA Birger Jarlsgatan 61 Stockholm, Sweden</p>	<p>Supports international national research institutions</p>	<p>Submission of proposals through local institutions to Sweden any time of the year.</p>
<p>6. International Atomic Energy Agency (IAEA) Wagramerstrasse 5 P.O. Box 100 A-1400 Vienna Austria</p>	<p>Use of nuclear techniques in areas of agriculture, medicine and natural sciences</p>	<p>Submission can be made any time of the year.</p>
<p>7. United Nations Industrial Development Organization (UNIDO) Vienna International Centre, Division of Industrial Operations P.O. Box 300 A-1400 Vienna Austria</p>	<p>Industrial projects</p>	<p>Sponsor research falling under industrial development projects of member countries. Proposals have to be approved by the national governments</p>
<p>8. World Health Organization Geneva, Switzerland or the Regional Office for Africa Division of Applied Research, P.B.6 Brazzaville. The Republic of Congo, or WHO Representative in your country</p>	<p>- Tropical diseases research (TDR) - Bilharziasis - Onchocerciasis - Trypanosomiasis - Malaria - Leprosy - Tuberculosis - Human reproduction - Diarrhoeal diseases - Nutrition</p>	<p>Proposals may be sent directly to Geneva for TDR Others may be sent via national WHO Representatives or sent to the Regional Office in Brazzaville. Write to obtain guidelines for submission of proposals and other pertinent information or contact WHO Representative in your country.</p>

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### A. Global research organizations (contd)

9. United Nations Fund for  
Science and Technology,  
Resident Representative,  
United Nations Development  
Programme (UNDP)  
P.O. Box 30218  
Nairobi, Kenya

Apply through the UNDP Representative of your  
country

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### B. National organizations

Many developing countries have public organizations under whose umbrella research funding falls. Many councils for science and technology undertake this function. In Kenya, the National Council for Science and Technology (NCST) has a research fund for persons wishing to undertake research in Kenya that falls within the research priorities of the Council.

### C. Institutional funding

There are institutions that fund research projects submitted by persons affiliated to them either as employees, students or associates. For example, university dean's committees operate research grants for university people and the Kenya Agricultural Research Institute (KARI) provides funds for research in Kenya in the area of agriculture.

### D. Bilateral assistance organizations

There are some organizations that fund research only as a component of a development project.

Examples of bilateral assistance organizations include Danish International Development Agency (DANIDA), Canadian International Development Agency (CIDA), German Agency for Technical Co-operation (GTZ), Japan International Co-operation Agency (JICA), Swedish International Development Authority (SIDA), Swiss Development Co-operation (SDC), the British Overseas Development Administration (ODA), the United States Agency for International Development (USAID), the Australian Centre for International Agricultural Research (ACIAR), and the World Bank.

**Appendix 3. EDITING SYMBOLS AND ABBREVIATIONS USED IN WRITING**

When writing a proposal, you need to decide on a writing style and symbols for communicating with typists, secretaries and editors. Below is a list of standard abbreviations and symbols. Section I gives abbreviations used in writing and Section II lists the marks and symbols used in editing or proofreading.

**Section I: Abbreviations used in writing**

p.	page
pp.	pages
ff.	and the following, used after a cited page to mean that the material referred to is continued to the next pages
éd.	editor
edn.	edition - a new issue of a book, with modifications revising the text
imp.	impression - reprint of work from the same type with no alterations. Not the same as "edn"
cf. or cp.	compare
v. or vide	see - used to refer a reader to another reference
<i>ibid.</i> or <i>ibiden</i>	the same place -- used instead of repeating the whole of the immediately preceding reference
<i>op. cit.</i>	the place cited immediately earlier
<i>loc cit.</i>	the name of the same work preceding after a intervening reference. Can also be used after an author's name to refer to his work already cited e.g. Lavi, <i>op. cit.</i> replaces the title and other details of publication already given
(sic)	thus -- used to indicate an error in a quoted passage.



## Formulation of Research Project Proposals

### Section II: Marks for copy preparation and proof correction

In using the following marks and symbols, note that:







For each marking-up or proof-correction instruction a distinct mark has to be inserted as follows:

- In the text to indicate the exact place to which the instruction refers, and
- In the margin to signify or amplify the meaning of the instruction.

Where a number of instructions occur in one line, the marginal marks are to be divided between the left and right margins where possible, the order being from left to right in both margins.




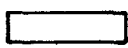



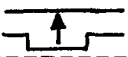
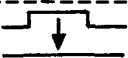






Specification details, comments and instruction may be included to amplify the textual and marginal marks but these should be distinguishable from the copy and from any correction made to the proof. This is done by encircling the instructions and/or by the use of different colours.

### Symbols and Abbreviations Used in Proof Reading

Marginal mark	Textual mark	Instruction or meaning
	Strike through characters to be deleted	Delete
	Strike characters and use mark	Delete and close up
New matter followed by /		Insert in text the matter indicated in margin
#		Insert space
	 linking characters	Close up, delete space between characters

## Formulation of Research Project Proposals

### Symbols and abbreviations (contd)

Marginal mark	Textual mark	Instruction or meaning
trs.		between characters or words Transpose
n.p.		Before first word of the new paragraph Begin a new paragraph
run on		between paragraphs No fresh paragraph here
		Indent
take over		Take over character(s) or line to next line, column or page.
take back		Take characters/line to previous line, column or page.
raise		Raise the element
lower		Lower the element
X	Encircle character(s) to be altered	Change damaged character (s)
/	/ or  through character where required	Substitute or insert column
‘/	/ or  through character where required	Substitute or insert apostrophe
”/	/ or  through character where required	Substitute or insert quotation mark
-/	/ or  through character where required	Substitute or insert hyphen
;/	/ or  through character where required	Substitute or insert semicolon
⊙	/ or  through character where required	Substitute or insert colon

## Formulation of Research Project Proposals

### Symbols and abbreviations (contd)

Marginal mark	Textual mark	Instruction or meaning
⊙	/ or $\wedge$ through character where required	Substitute or insert period
?/	/ or $\wedge$ through character where required	Substitute or insert question mark
!/	/ or $\wedge$ through character where required	Substitute or insert exclamation mark
(/)	/ or $\wedge$ through character where required	Substitute or insert parenthesis
□/□	/ or $\wedge$ through character where required	Substitute or insert (square) brackets
?	Encircle words, etc. affected	Refer to authority -- doubtful or query
sp	Encircle the word	Spelling-use correction(s) as spelled out in margin
Caps	≡ under characters to be altered	Change to capital letters
C & sc.	≡ under initial letters and = under the rest of the words	Use capital letters for initial letters and small capitals for the rest of the words
S.C.	= under characters to be altered	Change to even small capitals
l.c.	Encircle characters to be altered	Change to lower case
Rom.	Encircle characters to be altered	Change to roman type
underline	— under words affected	Underline word or words
eq #	between words	Make space appear equal between word

## Formulation of Research Project Proposals

### Symbols and abbreviations (contd)

Marginal mark	Textual mark	Instruction or meaning
<i>less #</i>	between words	Add space/ Reduce space between letters
<i>letter #</i>	between tops of letters requiring space	Add space between letters
<i>stet</i>	..... under characters to remain	Leave as printed/ Restore words crossed out
<i>spell out</i>	Encircle words or figures to be altered	Spell out abbreviations or figure in full

## *Formulation of Research Project Proposals*

### **Appendix 4. ESSENTIAL ELEMENTS OF A GOOD C. V.**

1. Name and current address
2. Place and date of birth and citizenship
3. Marital status
4. Institutional affiliation including position held to date
5. Academic qualifications:  
Schools, colleges, universities attended and certificates/diplomas obtained
6. Employment record if (4) is not sufficient
7. Special honours conferred, prizes and awards
8. Publications specified as:
  - (a) Thesis
  - (b) Papers in referred journals
  - (c) Conferences attended, papers presented, and papers in proceedings
  - (d) Books and chapters in books
  - (e) Technical reports, including popular articles
  - (f) Consultancy reports
9. Committees relevant to the profession in which one serves
10. Membership in professional associations
11. Relevant experience (in teaching, research, administration)
12. Research grants received and administered
13. Any other points and interests considered useful.

## **Appendix 5. SUBMISSION PROCEDURES FOR CLEARANCE AND FUNDING**

It is important that a researcher observes the established procedure for submission of research proposals. This has the advantage of facilitating the involvement of others in the project as well as facilitating speedy processing. Procedures vary from one institution/country to another. In some cases the procedures for submission of a research proposal require that the proposal be subjected to a seminar to lend it legitimacy. In some cases such proposals must be submitted through the head of the institution.

Different countries have different research clearance procedures. It is recommended that the researchers check with the relevant authorities in the country where the research is to be done to ensure that all clearance issues are taken into account.

Submission of a project proposal for funds and clearance can be done simultaneously. Most sponsors will only release money if clearance has been obtained.

On the other hand, some countries will give clearance if there is a positive indication that there are adequate funds for the project and also if the project is technically sound and consistent with national goals. But it is the sole responsibility of the researcher to obtain clearance.

Furthermore, a researcher should always bear in mind that the proposal will be subjected to technical evaluations by the potential sponsor. Such an evaluation can be as thorough as undertaking a cost and benefit analysis of the impact of the project proposal, including side effects. Since a research proposal is often the only contact the evaluators have with the initiator, it must be clearly written and must stand on its own merits. It is therefore recommended that, even where the protocols do not demand that a research proposal be scrutinized at a seminar, the researcher should refer the proposal to peers and research directors for comments.